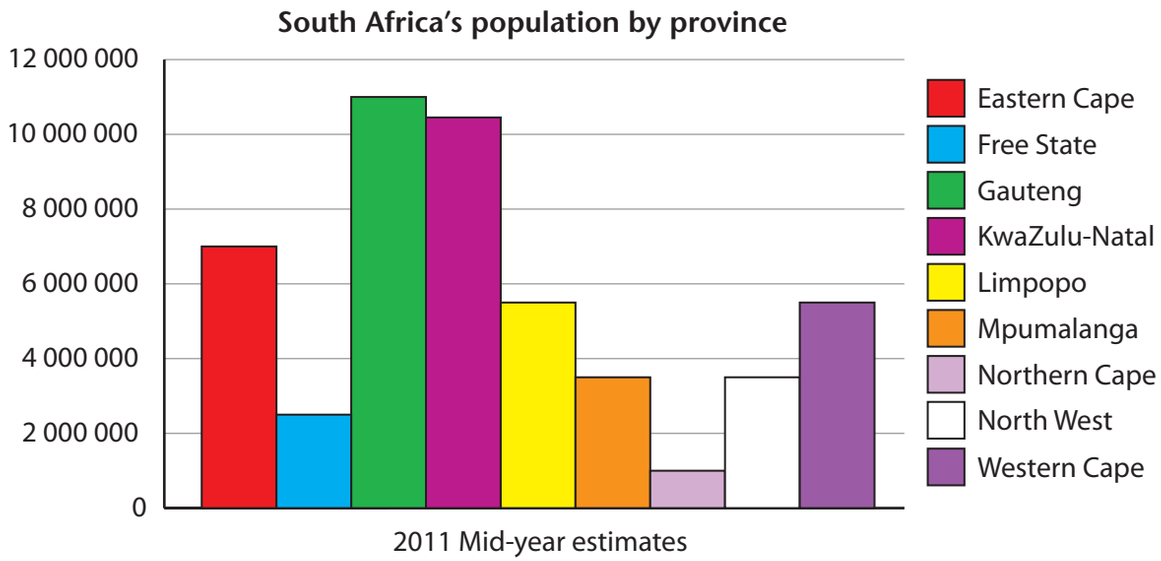
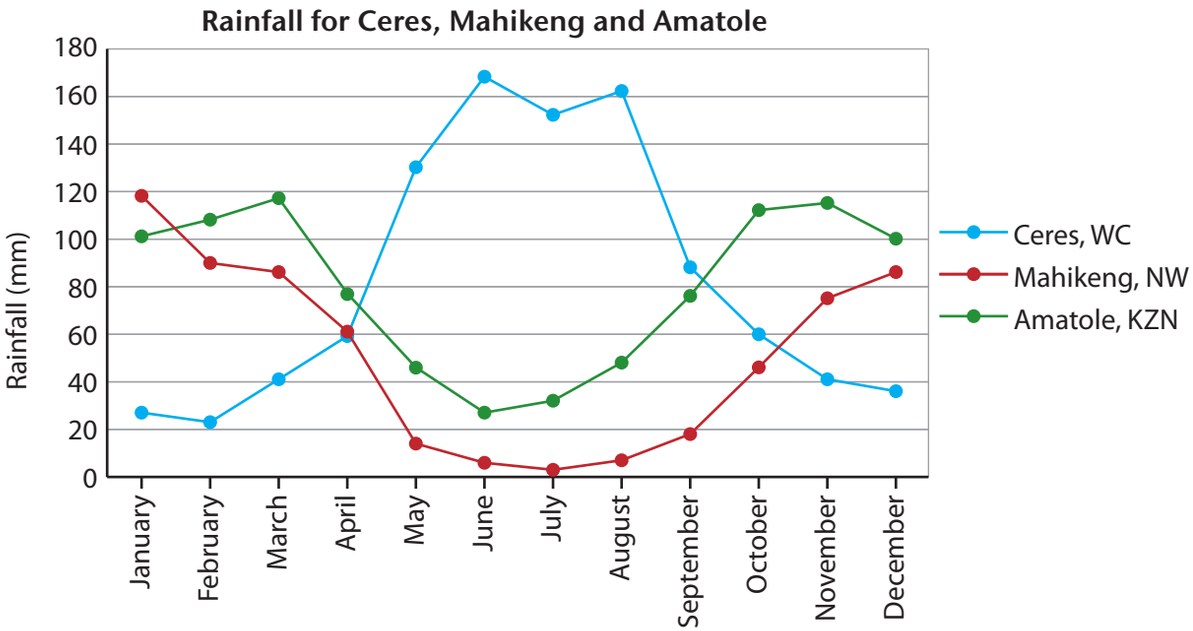
Chapter 9
Representing data

In the previous chapter, you focused on methods of collecting, organising and summarising data. Now we focus on representing data in bar graphs, double bar graphs, histograms, pie charts and broken-line graphs. You will practise drawing these graphs. You will also decide why a certain kind of graph is useful in a particular context.

Maths2_Gr9_LB_Book.indb 141 2014/09/08 09:07:06 AM





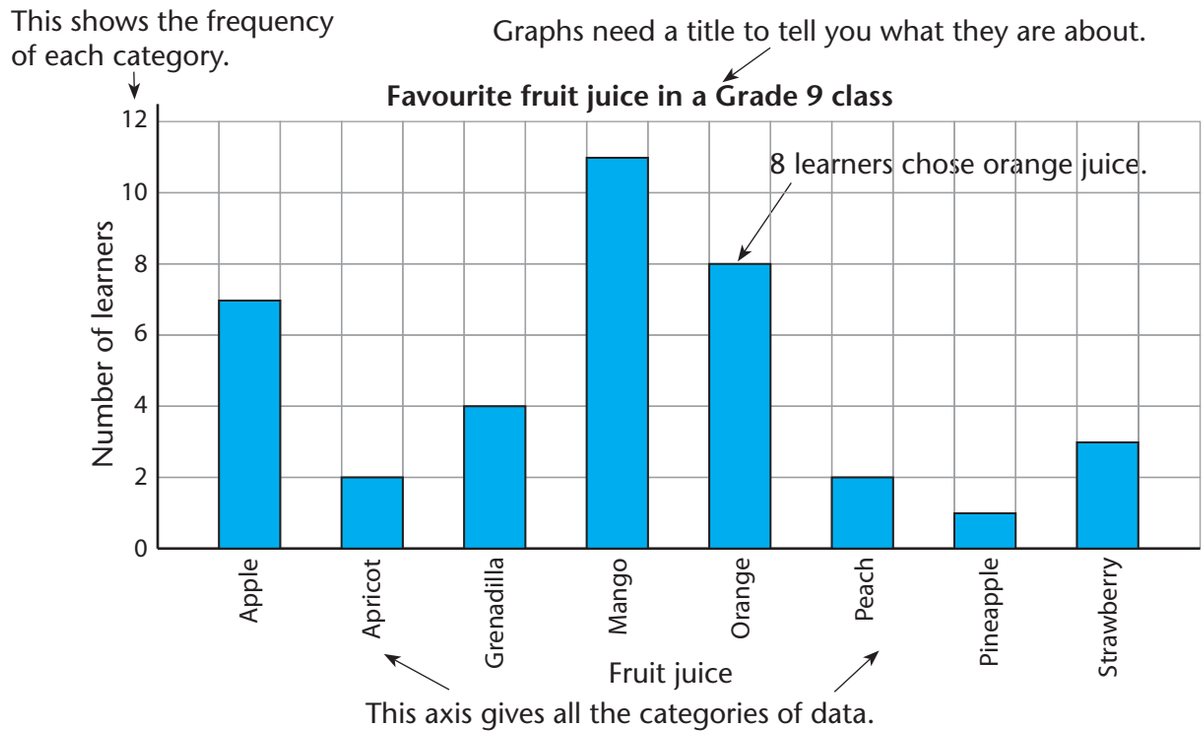
Maths2_Gr9_LB_Book.indb 142 2014/09/08 09:07:07 AM

9 Representing data

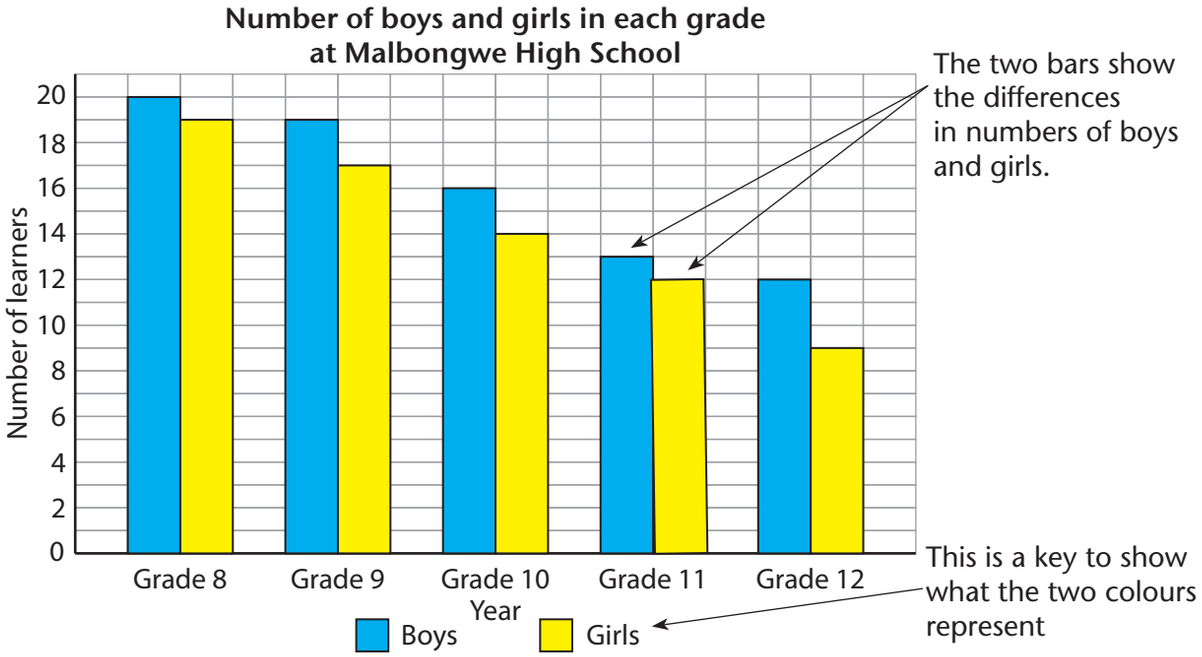
9.1 Bar graphs and double bar graphs

REVISING BAR GRAPHS AND DOUBLE BAR GRAPHS

A **bar graph** shows categories of data along the horizontal axis, and the frequency of each category along the vertical axis. An example is given below.



A **double bar graph** shows two sets of data in the same categories on the same set of axes. This is useful when we need to show two groups within each category.



Maths2_Gr9_LB_Book.indb 143 2014/09/08 09:07:07 AM

DRAWING BAR GRAPHS AND DOUBLE BAR GRAPHS

1. Obese (very overweight) people have many health problems. It is a concern all around the world. Health researchers analysed the change over 28 years in the numbers of people who are overweight and obese in different areas of the world. This table summarises some of the data.

Percentage of population that is overweight and obese

	1980	2008
Sub-Saharan Africa	12%	23%
North Africa and Middle East	33%	58%
Latin America	30%	57%
East Asia (low income countries)	13%	25%
Europe	45%	58%
North America (high income countries)	43%	70%

(a) The table summarises "some" of the data. What would some other important data be? Think of as many things as you can.

.....

.....

.....

.....

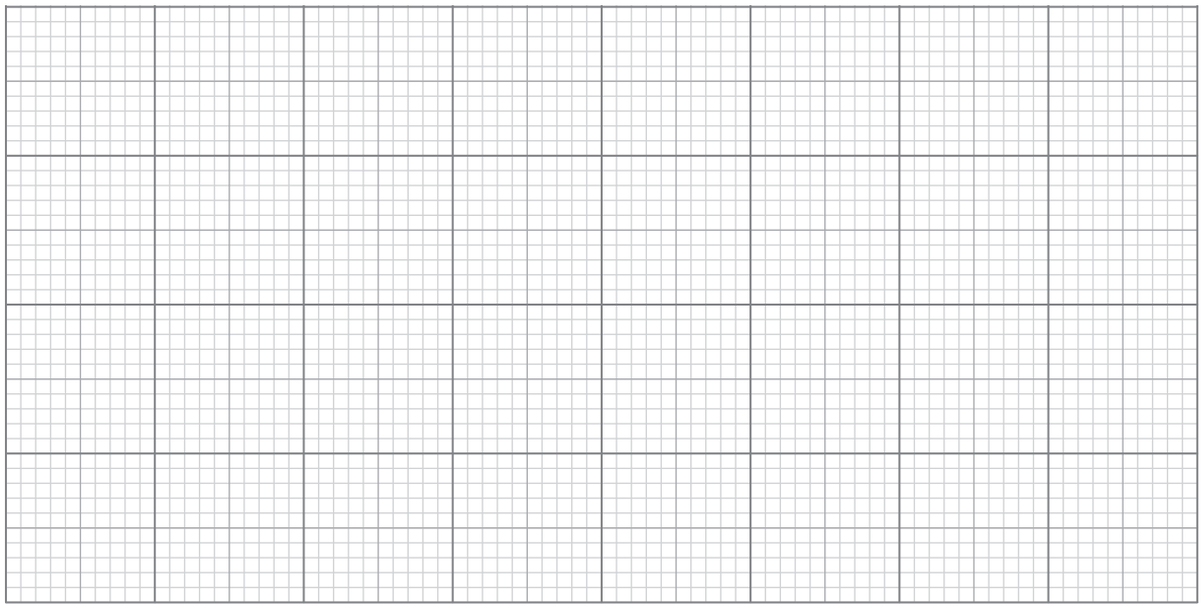
(b) Which data stands out the most for you in the table above? Give your personal opinion.

.....

.....

(c) Plot a double bar graph to compare the data for the areas, and for the two years. Use the grid on the next page. Remember to give your graph a key.

Maths2_Gr9_LB_Book.indb 144 2014/09/08 09:07:07 AM



(d) Look carefully at the comparisons that the graph makes. Has your opinion of the most interesting differences changed, now that you see the double bar graph? Explain.

.....

.....

.....

.....

.....

.....

.....

(e) In some countries the obesity problem has been labelled "Obesity in the face of poverty". Write a short report on the data and your double bar graph to support this argument.

.....

.....

.....

.....

.....

Maths2_Gr9_LB_Book.indb 145 2014/09/08 09:07:07 AM

9.2 Histograms

REVISING HISTOGRAMS

A histogram is a graph of the frequencies of data in different **class intervals**, as demonstrated in the example below. Each class interval is used for a range of values. The different class intervals are consecutive and cannot have values that overlap. The data may result from counting or from measurement.

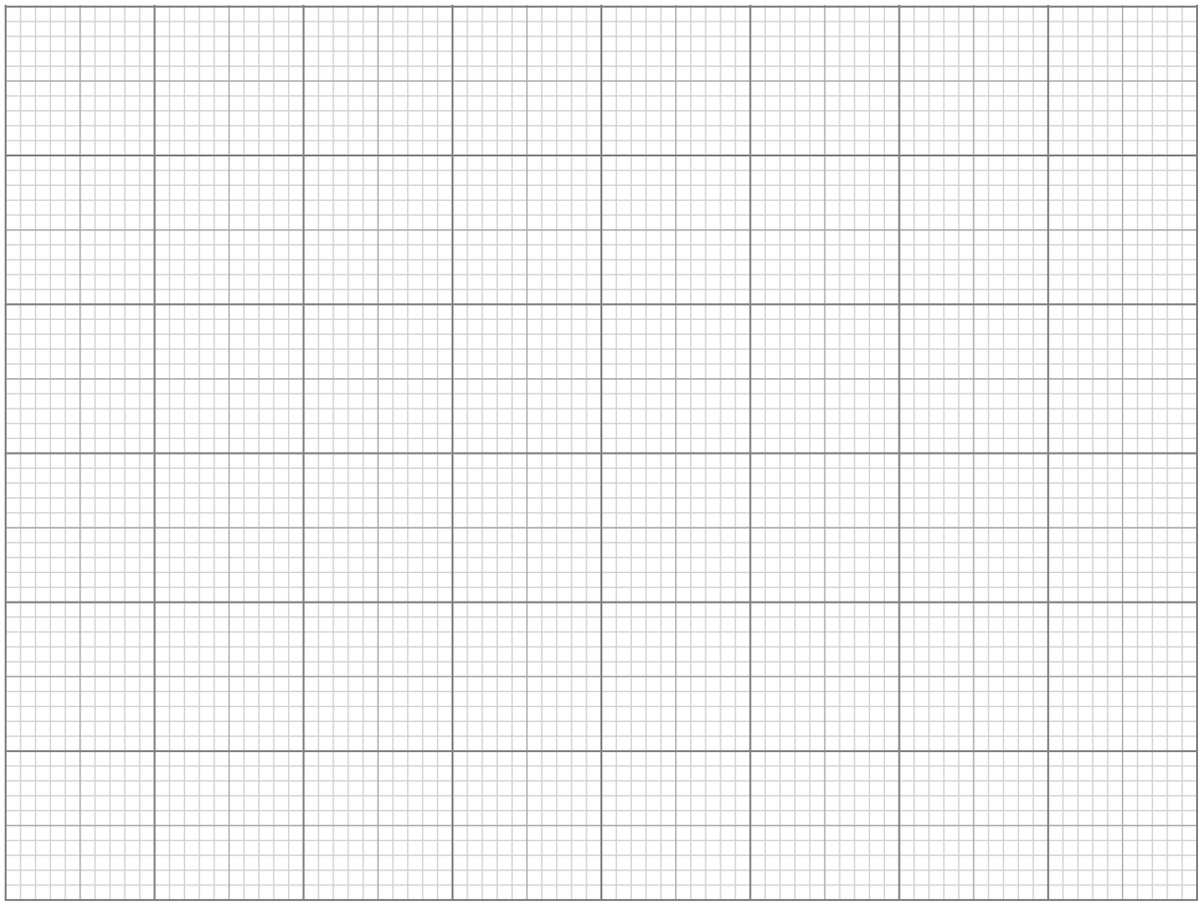
A histogram looks somewhat like a bar graph, but is normally drawn without gaps between the bars.

REPRESENTING DATA IN HISTOGRAMS

1. (a) A fruit farmer wants to know which of his trees are producing good plums, and which trees need to be replaced.
He collects 100 plums each from two trees and measures their masses.
The data below gives the mass of plums from the first tree.

Mass of plums (g)	20–29	30–39	40–49	50–59	60–69
Frequency	6	18	34	30	12

Represent the data in a histogram on the grid below.



Maths2_Gr9_LB_Book.indb 146 2014/09/08 09:07:07 AM

(b) Now draw another histogram to represent the following data giving the mass of the same type of plums from another tree in the orchard.

Mass of plums (g)	20–29	30–39	40–49	50–59	60–69
Frequency	3	14	26	36	21

.....

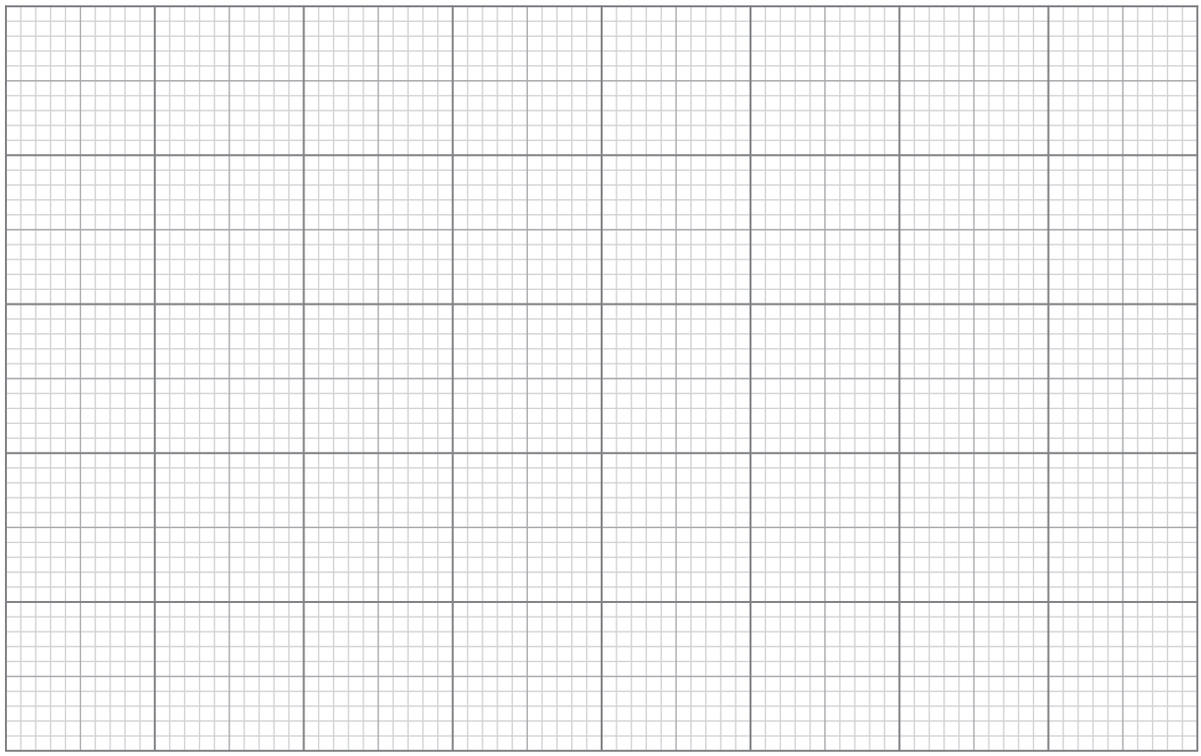
.....

.....

.....

.....

.....



(c) Study the two histograms and then comment on the number of plums produced by the two trees.

.....

.....

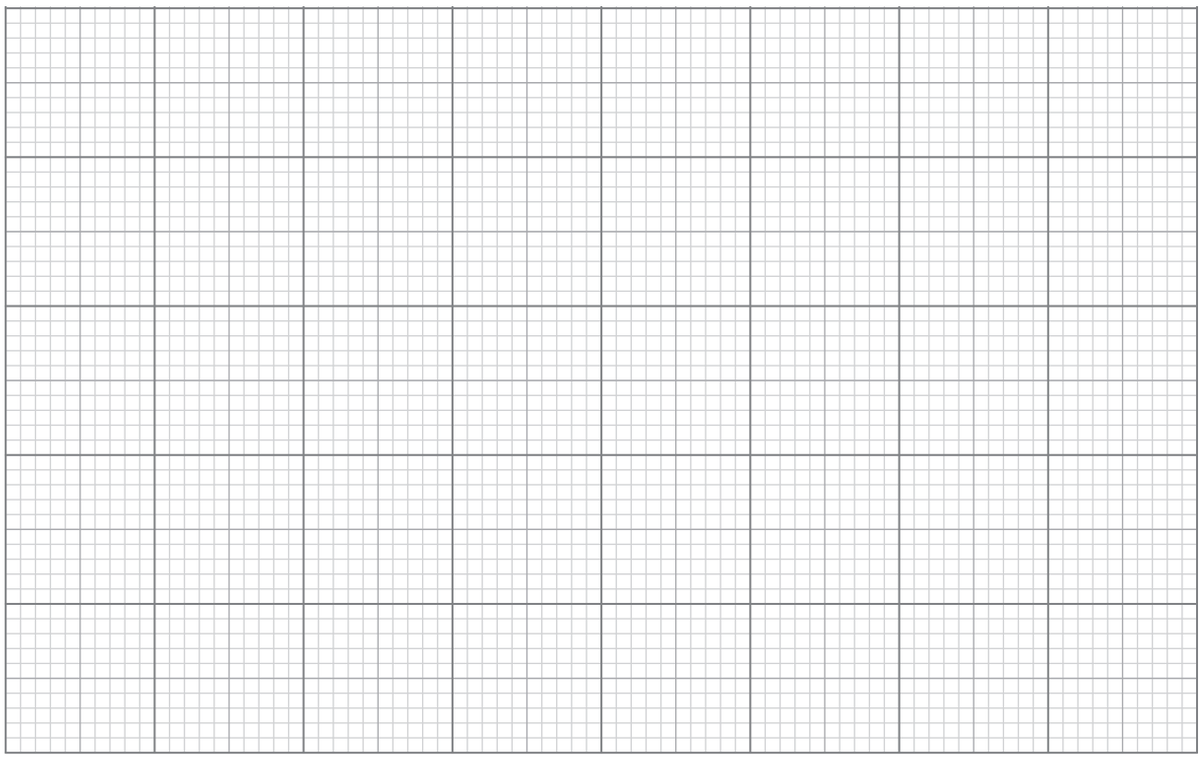
.....

Maths2_Gr9_LB_Book.indb 147 2014/09/08 09:07:07 AM

2. (a) Draw a histogram to represent the data in the table below. Group the data in intervals of 0,5 kg.

Birth weights (kg) of 28 babies at a clinic

3,3	1,34	2,88	2,54	1,87	2,06	2,72
1,89	0,85	1,99	2,43	1,66	2,45	1,62
1,91	1,20	2,45	1,38	0,9	2,65	2,88
1,75	2,11	3,2	1,74	0,6	3,1	1,86



.....

.....

.....

(b) Calculate the mean and median of the data.

.....

(c) Records from the whole country show that the birth weight of babies ranges from 0,5 kg to 4,5 kg, and the mean birth weight is 3,18 kg. Use the graph and the mean and median to write a short report on the data from the clinic.

.....

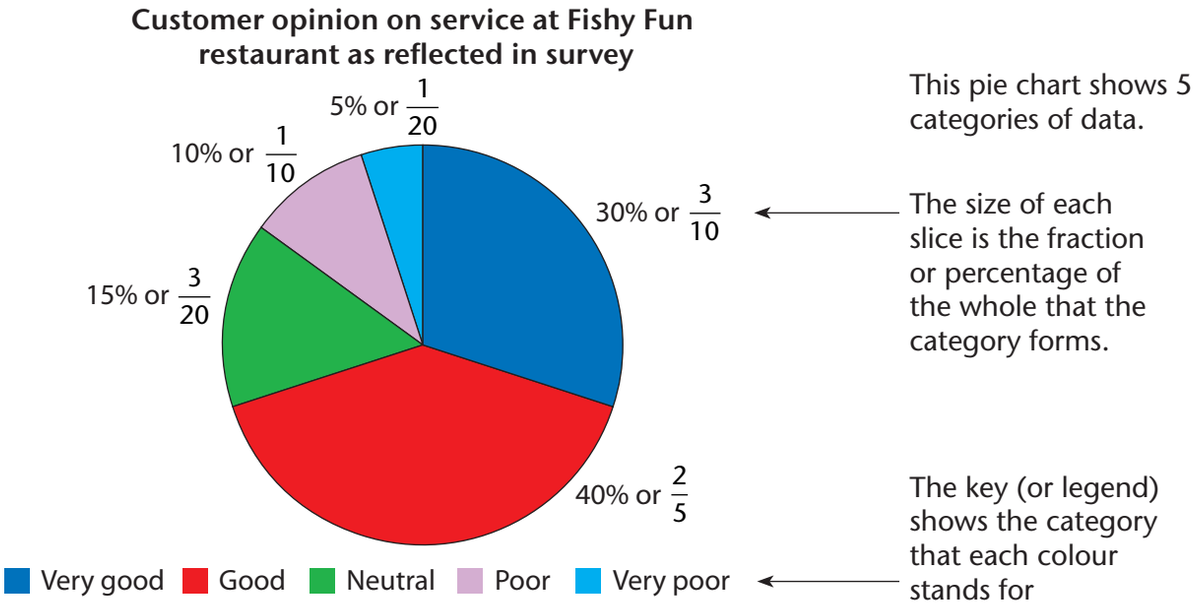
.....

Maths2_Gr9_LB_Book.indb 148 2014/09/08 09:07:08 AM

9.3 Pie charts

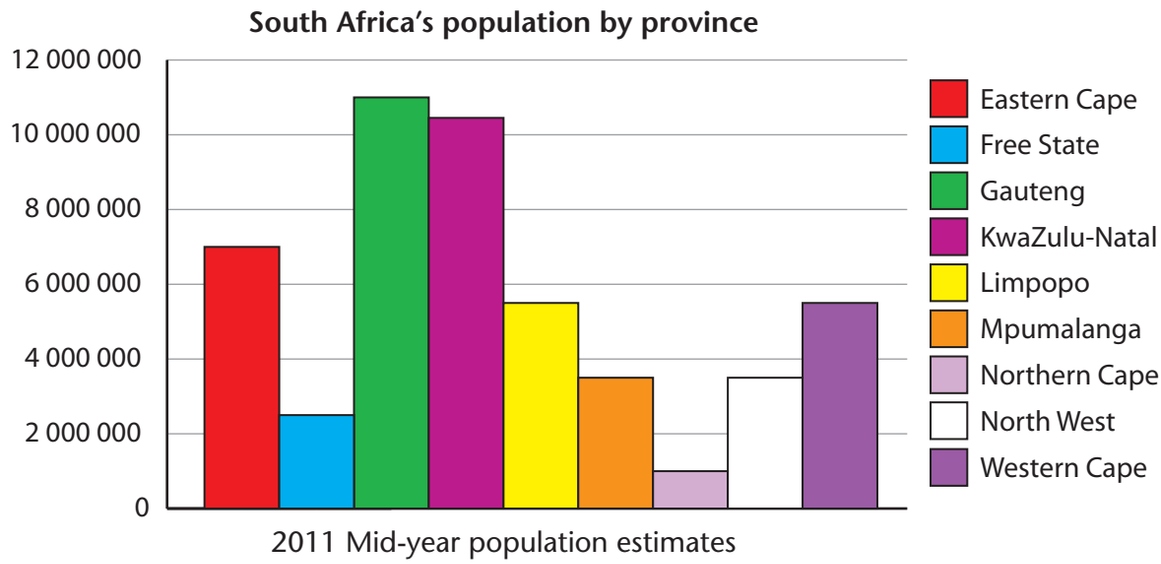
A **pie chart** consists of a circle divided into sectors (slices). Each sector shows one category of data. Bigger categories of data have bigger slices of the circle.

Here is an example of a pie chart:



DRAWING PIE CHARTS

1. The following bar graph shows the population of South Africa by province.



(a) Write the figures in the graph correct to the nearest 500 000.

Province	E Cape	FS	Gau	KZN	Lim	Mpum	NC	NW	WC
Population (× 1 000)									

(b) What is the total of the rounded off numbers? .....

Maths2_Gr9_LB_Book.indb 149 2014/09/08 09:07:08 AM

(c) Work out the percentage of the whole for each province.

Province	E Cape	FS	Gau	KZN	Lim	Mpum	NC	NW	WC
Percentage of total									

(d) Draw a pie chart showing the data in the completed table. (Estimate the sizes of the slices.)

(e) Write a short report explaining the difference in the way the data is represented in the pie chart and the bar graph. Which do you think is a better method to show this data?

Maths2_Gr9_LB_Book.indb 150 2014/09/08 09:07:08 AM

9.4 Broken-line graphs

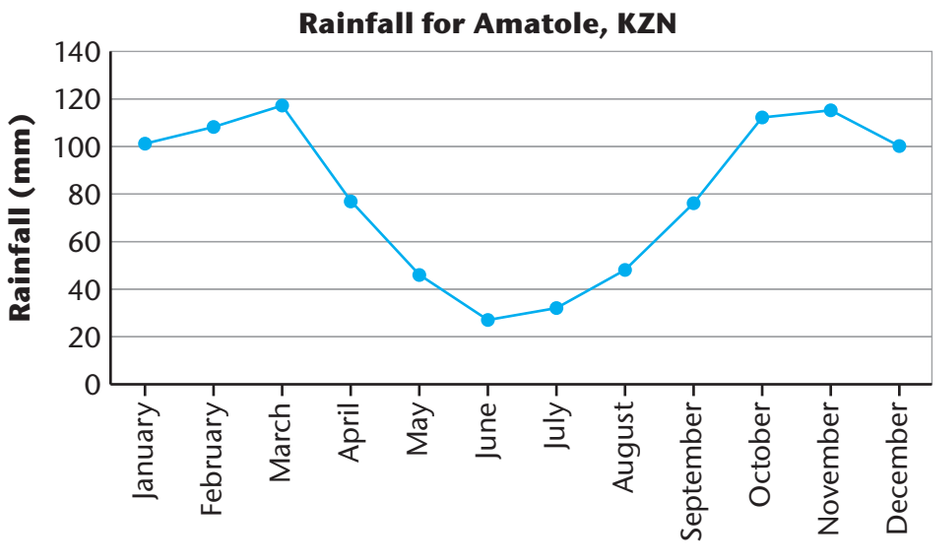
BROKEN-LINE GRAPHS

Broken-line graphs are used to represent data that changes continuously over time. For example, the rainfall for a whole month is captured as one data point, even though the rain is spread out over the month, and it rains on some days and not on others. Broken line graphs are useful to identify and display trends.

Here is some data that can be represented with broken-line graphs.

Rainfall at three locations in South Africa in 2012			
	Amatole, KZN	Mahikeng, NW	Ceres, WC
	Rainfall (mm)	Rainfall (mm)	Rainfall (mm)
January	101	118	27
February	108	90	23
March	117	86	41
April	77	61	60
May	46	14	130
June	27	6	168
July	32	3	152
August	48	7	162
September	76	18	88
October	112	46	60
November	115	75	41
December	100	86	36

Here is a broken line graph for the Amatole rainfall data.



Maths2_Gr9_LB_Book.indb 151 2014/09/08 09:07:08 AM

1. During which four months does Amatole have the least rain?

   .....

2. During which six months does Amatole have the most rain?

   .....

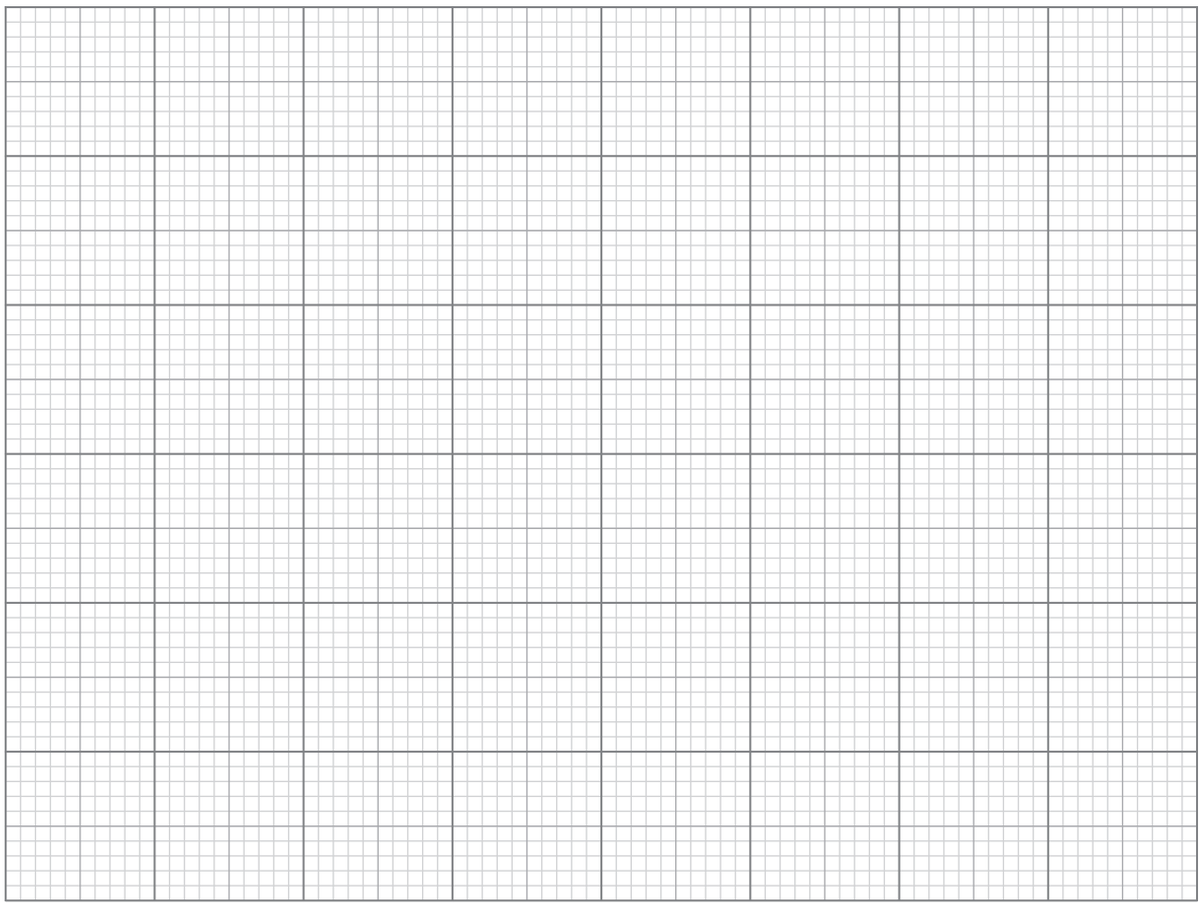
3. During which months would you plan a hike if you were only considering the rainfall patterns?

   .....

4. What other factors should you consider when planning a hike in this region?

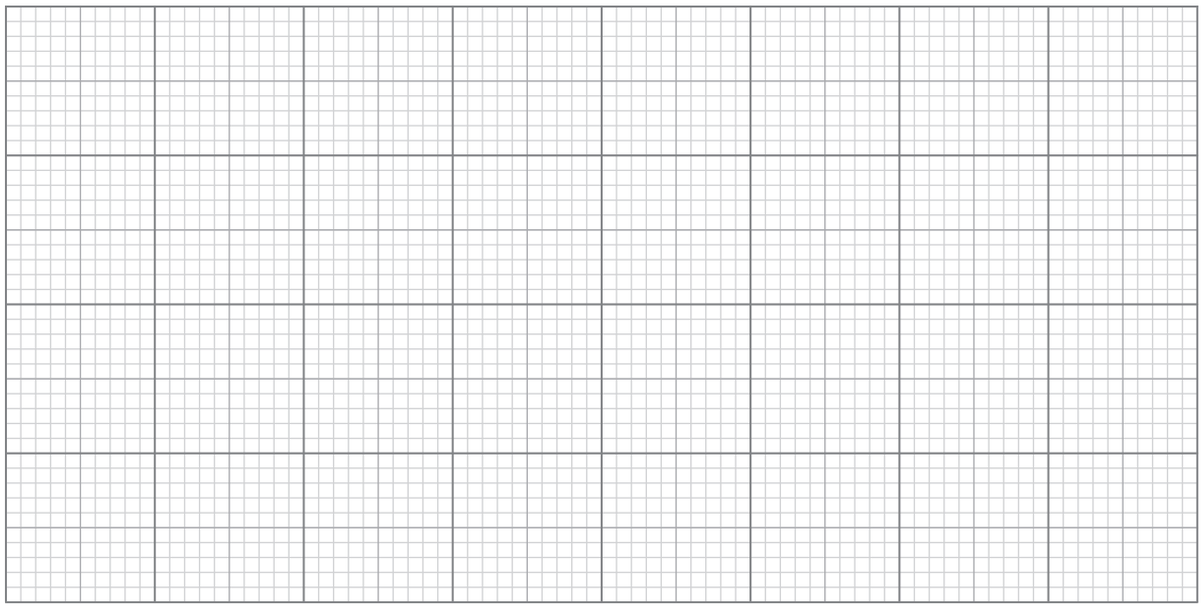
   .....

5. Make a broken-line graph for the Mahikeng rainfall data on the grid below.



Maths2_Gr9_LB_Book.indb 152 2014/09/08 09:07:08 AM

6. Make a broken-line graph for the Ceres-rainfall data on the grid below.



7. Write a few lines on the difference in rainfall patterns between Ceres and Mahikeng.

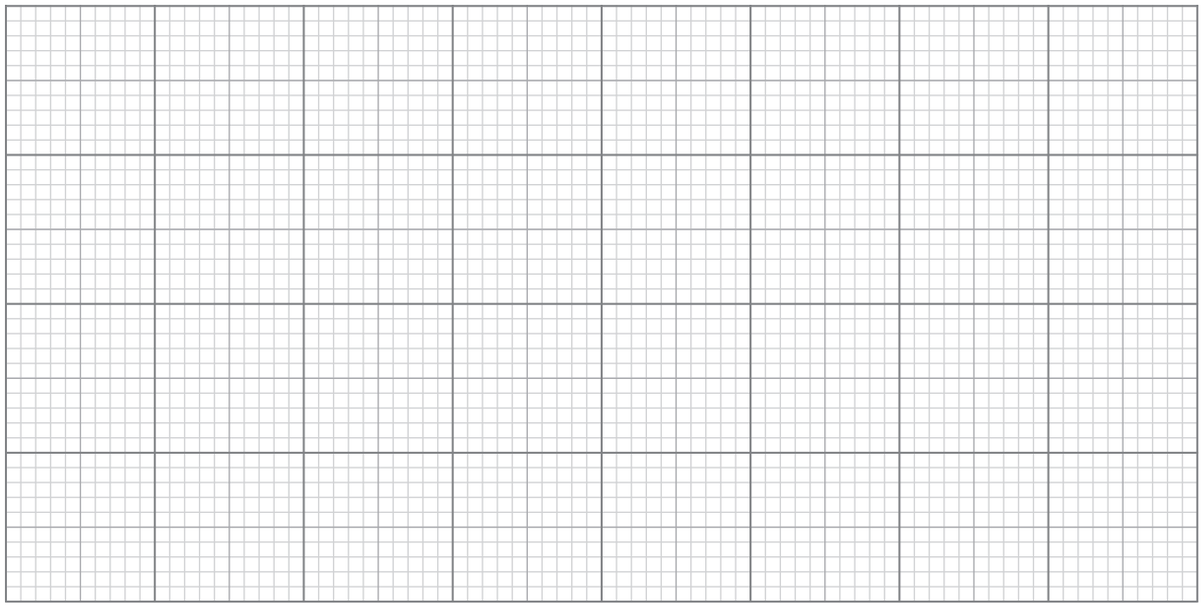
.....

.....

.....

.....

8. Draw a combined broken-line graph with the information from all three regions on one graph.



Maths2_Gr9_LB_Book.indb 153 2014/09/08 09:07:09 AM

9.4 Scatter plots

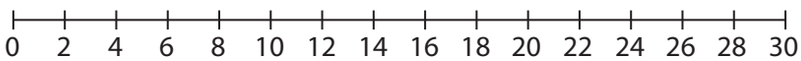
UNDERSTANDING AND CONSTRUCTING SCATTER PLOTS

Scatter plots show how two sets of numerical data are related. Matching pairs of numbers are treated as coordinates and are plotted as a single point. All the points, made up of two data items each, show a scattering across the graph.

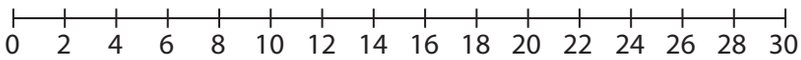
1. This table shows a data set with **two** variables. Study the information in the table.
2. Make a dot for each learner's mark for each subject on the number lines below.

Learners	Maths marks	Natural Science marks
Zinzi	**25**	**26**
John	23	25
Palesa	**22**	**25**
Siza	21	23
Eric	20	23
Chokocha	19	21
Gabriel	17	20
Simon	16	19
Miriam	15	18
Frederik	15	16
Sibusiso	**12**	**15**
Meshack	11	13
Duma	11	12
Samuel	10	12
Lola	10	11
Thandile	9	10
Jabulani	**8**	**10**
Manare	7	9
Marlene	7	7
Mary	5	7

Natural Sciences marks

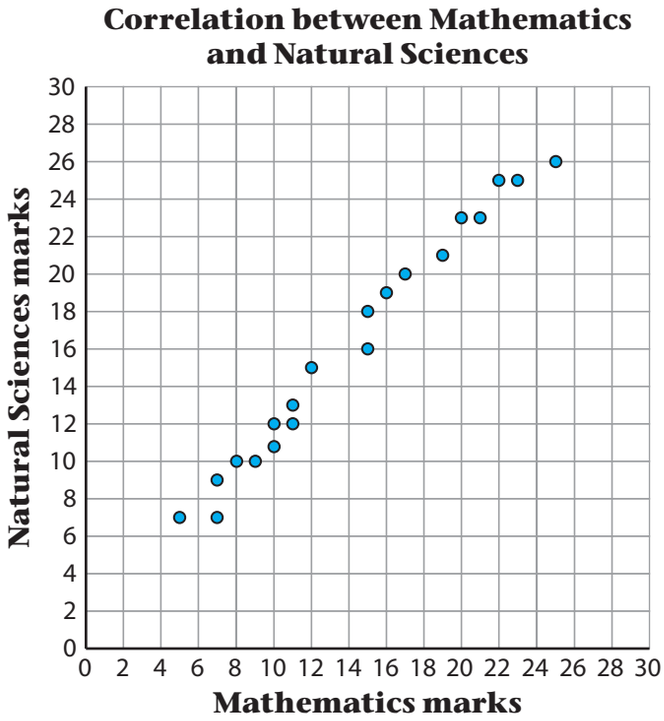


Mathematics marks



Maths2_Gr9_LB_Book.indb 154 2014/09/08 09:07:09 AM

3. What if you were to show both sets of marks on the same graph, instead of a separate number line for each set? The graph below shows a scatter plot that represents both sets of data. Each dot represents one learner.



The scatter plot shows the **relationship** between the Natural Sciences mark and the Mathematics mark.

4. Find the dot for Sibusiso in the data set. He obtained a mark of 12 for the Mathematics test and a mark of 15 for Natural Sciences. Find 12 on the horizontal axis. Follow the vertical line up until you reach a blue dot. Find 15 on the vertical axis. Follow the line horizontally until you reach the same blue dot. This blue dot represents the two marks that belong to Sibusiso. Circle the blue dot and label it S.

5. Find the data points for Zinzi, Palesa, Jabulani and Mary. Circle them and label them Z, P, J and M.

In the above example, a higher Mathematics mark corresponds to a higher Science mark. We say there is a **positive correlation** between the Mathematics marks and the Science marks.

Maths2_Gr9_LB_Book.indb 155 2014/09/08 09:07:09 AM

6. Study this data set and the scatter plot of the data given on the next page.

Learner	Maths marks	Art marks
Zinzi	**25**	**7**
John	23	7
Jabulani	22	9
Siza	21	10
Eric	**20**	**10**
Chokocha	19	11
Gabriel	17	12
Simon	16	12
Miriam	**15**	**15**
Frederik	**15**	**15**
Sibusiso	12	16
Mishack	11	17
Duma	11	19
Samuel	**10**	**20**
Lola	10	21
Thandile	9	23
Palesa	8	23
Manare	7	25
Marlene	7	25
Mary	**5**	**26**

7. Find Eric in the table. Note his marks for Mathematics and Art. Find the dot that represents his marks on the scatter plot. Encircle it and label it E.

8. Find Samuel in the table. Note his marks for Mathematics and Art. Find the dot that represents his marks. Encircle it and label it S.

9. Compare the two sets of marks for Eric and for Samuel. What do you notice about the marks?

.....

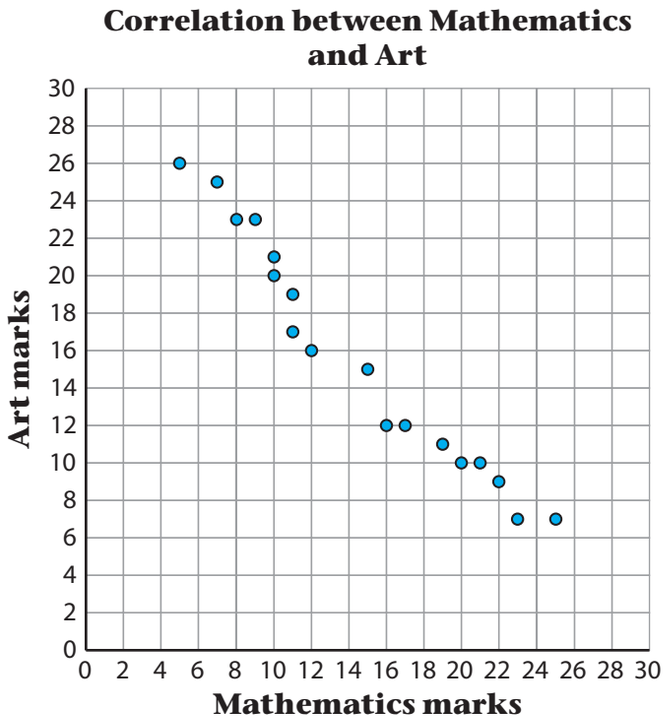
.....

Maths2_Gr9_LB_Book.indb 156 2014/09/08 09:07:09 AM

10. Find the data points on the scatter plot for Zinzi, Eric, Miriam, Frederik, Samuel and Mary. Circle the points and label them Z, E, M, F, S and Ma

11. What do you notice about the pattern of marks in Mathematics and Art for this data set?

.....

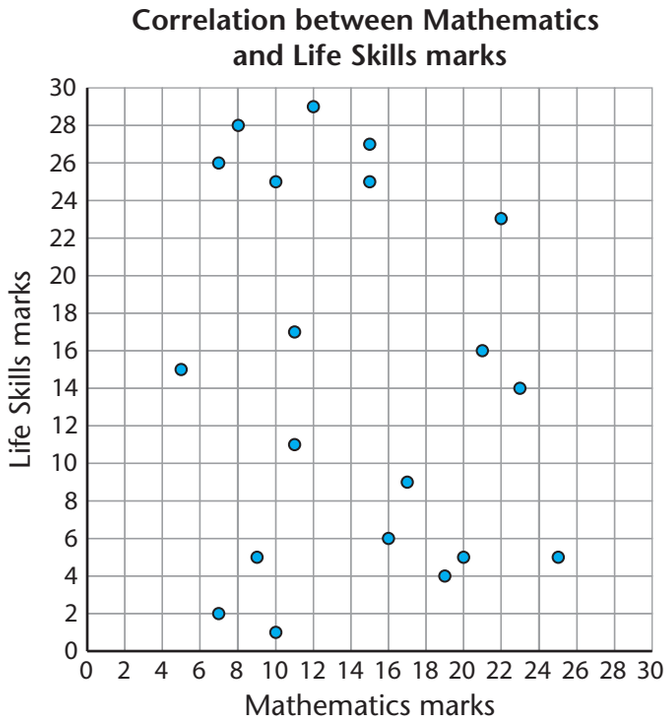


A **negative correlation** is a correlation in which an increase in the value of one piece of data tends to be matched by the decrease in the other set of data. Learners who obtain a high mark for Mathematics appear to obtain a low mark for Art. We say there is a negative correlation between the Mathematics and the Art scores for this data set.

A correlation is an assessment of how strongly two sets of data appear to be connected. Two sets of data may be correlated or may show **no correlation.**

Maths2_Gr9_LB_Book.indb 157 2014/09/08 09:07:09 AM

Here is the scatter plot for the Mathematics and Life Skills marks of the same group of learners. The table for this data is given on the next page.



12. Study the scatter plot and the data table on the next page.

13. Find the data points on the scatter plot for Zinzi, Eric, Miriam, Lola, and Mary. Circle the points and label them Z, E, M, L and Ma.

14. What do you notice about the pattern of marks in Mathematics and Life Skills for this data set?

.....

.....

Maths2_Gr9_LB_Book.indb 158 2014/09/08 09:07:10 AM

Learner	Maths	Life Skills
Zinzi	25	5
John	23	14
Jabulani	22	23
Siza	21	16
Eric	20	5
Chokocha	19	4
Gabriel	17	9
Simon	16	6
Miriam	15	25
Frederik	15	27
Sibusiso	12	29
Meshack	11	17
Duma	11	11
Samuel	10	1
Lola	10	25
Thandile	9	5
Palesa	8	28
Manare	7	26
Marlene	7	2
Mary	5	15

THE RELATIONSHIP BETWEEN ARM SPAN AND HEIGHT

The idea that a person's arm span (the distance from the tip of the middle finger on one hand to the tip of the middle finger on the other hand when the arms are stretched out sideways) is the same as one's height has been explored many times.

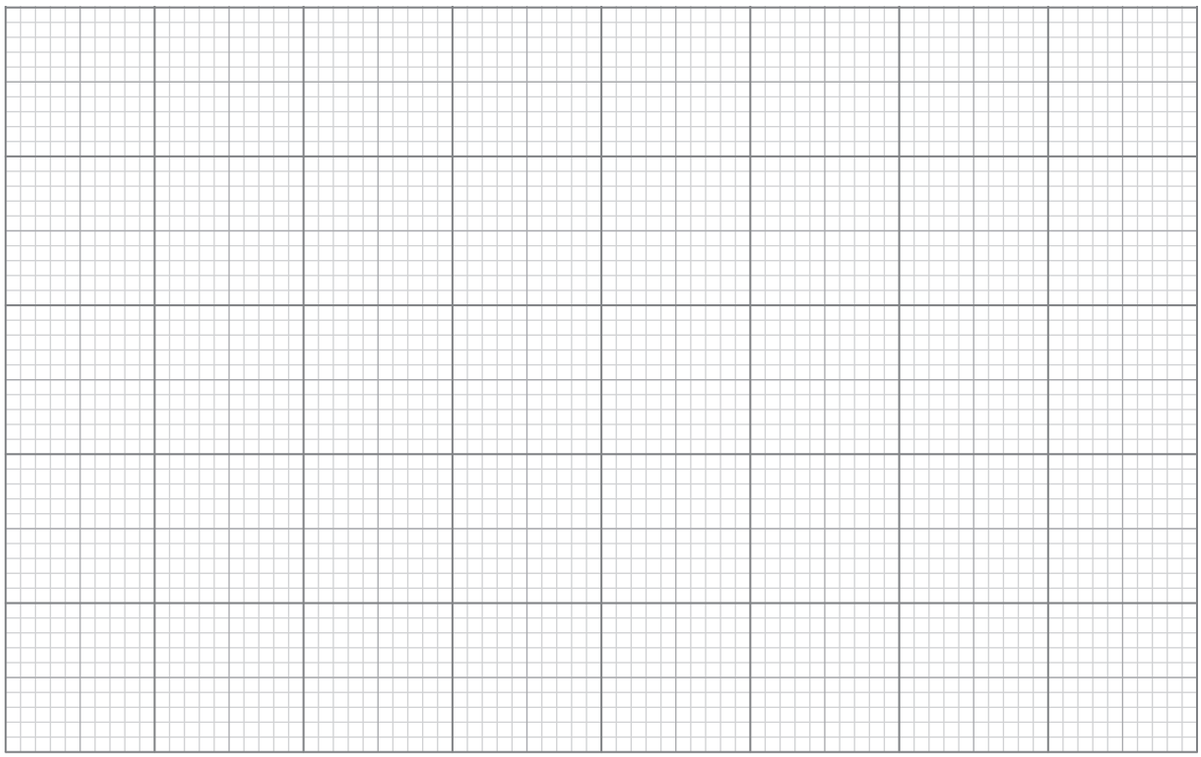
A data set for 13 people is given on the next page.

1. Make a scatter plot of this data on the given grid.

   For example, take Cilla's arm span. Find 156 on the horizontal axis. Follow a vertical line up. Then on the vertical axis find 162. Follow a horizontal line across. Where the two points meet, draw a dot.

Maths2_Gr9_LB_Book.indb 159 2014/09/08 09:07:10 AM

Person	Arm span	Height
Cilla	156	162
Meshack	159	162
Tony	161	160
Ellen	162	170
Karin	170	170
Sibongile	173	185
Gabriel	177	173
Alpheus	178	178
Mfiki	188	188
Nathi	188	182
Manare	188	192
Khanyi	196	184



2. What would you say about the correlation between the arm span and the height?

.....

Maths2_Gr9_LB_Book.indb 160 2014/09/08 09:07:10 AM